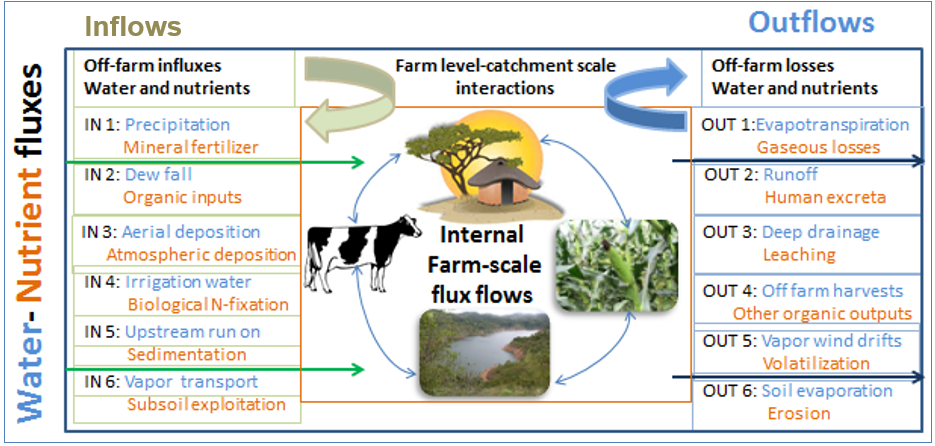
**Crop nutrient dynamics: calculator for fertilizer requirements**

**Background**

In the past, fertilizer practices for many of the crops grown in sub Saharan Africa were adopted from research but there are various changes that have taken place over the years and these recommendations are dated. There is need to consider for differences in vegetative growth and crop growth cycles, geographic locations, soil types, management, and varietal and environmental factors. As a result, many fertilizer recommendations and rates applied need verification to ensure that they are appropriate, and do not result in over-fertilizing the soil, a detriment to the environment and an extra expense to the farming family.



**Water-nutrient dynamics within smallholder farming systems**

**Problems caused by overfertilising**

Overfertilising is a major concern in crop production, as it:

* contributes to the problems of soil acidification, salinity and soil structure;
* causes nutrient imbalance;
* increases the levels of nitrate and phosphate contamination in waterways (and groundwater), leading to algal blooms and aquatic weed growth — a concern to all environmentally conscious people;
* wastes farmers’ money.

**New strategy: crop nutrient replacement**

Sustainable fertilizer management involves:

* maximising crop growth production;
* preventing on-site soil degradation;
* minimising off-site movement of nutrients.

For these reasons, crop nutrient replacement provides a sound basis for determining annual fertiliser recommendations.

With crop nutrient replacement:

* nutrients removed from the soil by the crop are determined;
* nutrients removed by the leaves, shoots and roots have been established from overseas and local research;
* losses from leaching, erosion and soil fixation are estimated.

Application rates for fertilizers are based on these calculations, rather than on prescribed amounts.

This fertilizing method should prevent underfertilizing and overfertilising. On a highly fertile soil, replacing all nutrients that have been removed may not be necessary due to adequate soil reserves. This is why monitoring using soil and leaf analysis is so important.

**Fertilizer optimization tool:**

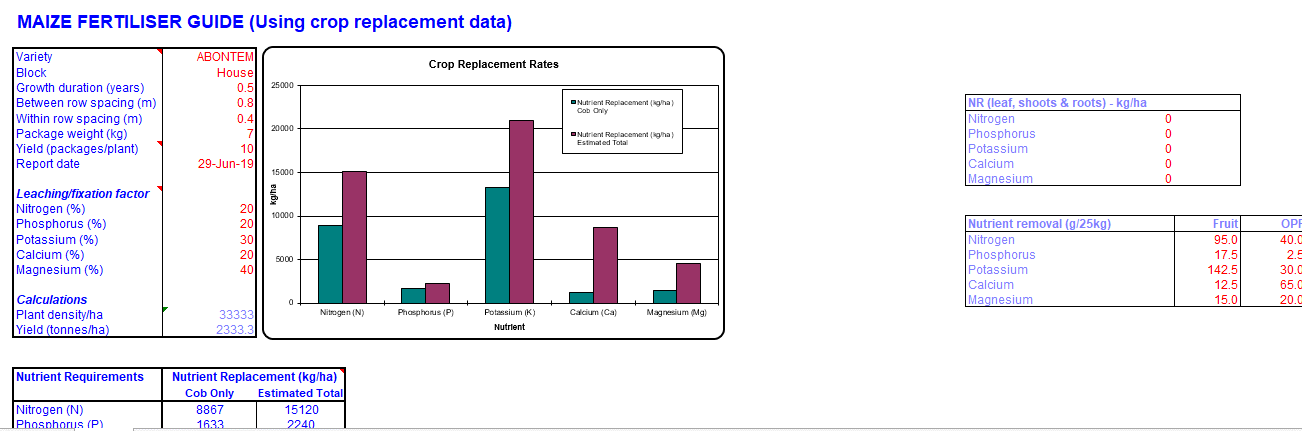
Extension agents will be able to calculate the crop nutrient replacement for a range of crops by using a relatively simple software program (spreadsheet). The following information is entered into the spreadsheet:

* plant spacing;
* yield;
* soil leaching;
* phosphorus fixation percentages.

The program then calculates:

* plant density;
* yield per hectare;

and constructs graphs of:

* crop nutrient removal;
* total nutrient replacement.

**Next steps:**

This work is still in progress since we need to assess soil moisture fluxes and the leaching requirements associated with the maize cowpea systems.

Final results of this work will be concluded in November 2019.